THE MIGHTY MISSISSIPPI

IMPACTS TO THE RIVER

The Mississippi River's name is said to derive from the American Indian expression "Mee-see-see-bee" which means "Father of Waters." Loyd Lewis described the river as "The Spinal Column of America." For thousands of years the river and its tributaries have been central to human societies. The river is truly one of America's greatest treasures and has grown into a vital economic resource. Today, the river serves as a route for the transportation of goods, with close to 500 hundred million tons of cargo shipped on the river each year. Almost half the grain exported from the United States moves down the river. The river and its floodplain also creates unique habitats for a diverse range of biological systems. An estimated 2.6 billion dollars a year is spent on recreational activities along the river by those who enjoy its beauty.

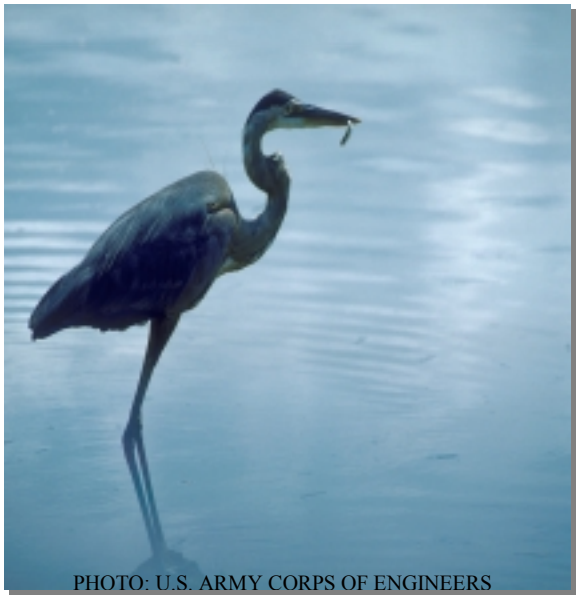


PHOTO: U.S. ARMY CORPS OF ENGINEERS

The river we know today is significantly altered from the river of just a hundred years ago. The river has been impacted by the continued development of its waterway and surrounding lands. The lower river is primarily contained to a set channel, in order to facilitate transportation. The upper river is affected by a series of 27 locks and dams installed along its length. The river faces pollution from a variety of sources, and a significant amount of the river's wetlands have been lost as a result of both development within the flood plain and the containment of the river to a channel. The river's terminal delta in the Gulf of Mexico is increasingly impaired by many of the alterations of the river. Invasive species have begun to change the river's ecosystems with yet to be determined results. As a result of such changes many of the river's native species are threatened. One-third of the native fish species found on the upper Mississippi River have been placed on state and federal watch lists. Twenty of the river's mussel species have become extinct and several more have now been added to state and federal watch lists. Historically, as many as 50 mussel species occupied the upper Mississippi River, representing one of the most diverse mussel populations in the world. Sedimentation, pollution and invasive species have severely impacted the river's mussels. River mussels are indicators of water quality and key links in the river's food chains. The loss of these native plants and animals represents a loss of biological diversity and productivity across the entire river basin.

BIOLOGICAL SYSTEMS OF THE MISSISSIPPI RIVER BASIN

WETLANDS

Historically, the Mississippi River was free to meander within its river basin, periodically flooding the surrounding bottomlands or completely shifting location. As a result, the land near the river's edge was often covered by shallow water, generating waterlogged soils and yielding wetland areas. Such wetlands represent some of the most productive biological zones on the planet. The river's bogs, marshes and swamps provide habitat for a wide variety of wildlife and in many cases serve as the primary breeding zones for the rivers native fish.

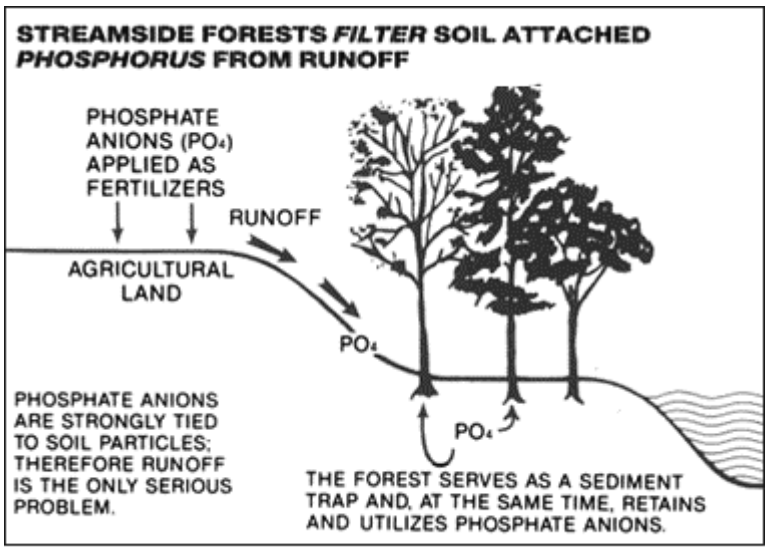
PHOTO: U.S. ARMY CORPS OF ENGINEERS

Wetlands also help to purify the river's waters. These systems help filter out suspended solids and the active bacterial communities found within saturated soils and sediments can treat pollutants and remove organic matter from the water. Modern wastewater treatments systems utilize the same principles naturally occurring in wetland sediment systems and in some ways represent an engineered form of this process.

The Mississippi River today is one of the most highly engineered rivers in the United States with large stretches of river contained to a central channel. The river is now largely separated from its flood plain and millions of acres of wetlands have been lost. The natural spring rises and fall drops in water level have been buffered by the flow control systems present on the river. The modern Mississippi River is less able to replenish the surrounding wetland areas and this has resulted in not only a loss of critical wildlife habitat but also a reduction in the ability of the river to naturally cleanse itself of pollution.

RIPARIAN ZONES

The floodplain forests are another important component of the Mississippi River system. Forests have thrived in the rich soils deposited by the river for thousands of years. Riparian zones are areas of lush growth of water tolerant plants such as sycamore, willow, cottonwood and sedges that grow along the river's edge. Such floodplain forests where utilized heavily in the 1800s for lumber and firewood. Steamboats required huge quantities of split wood to fuel the boilers of the boats' engines. As a result, most of the trees were cut from the river's islands and banks. Sections of the river basin were also cleared of forest to support development. These actions resulted in changes to the forest's diversity and density.



Reference: Maryland Department of Natural Resources

Intact riparian zones provide a buffer zone around waterways. Riparian areas can mitigate the effects of poor watershed practices by slowing down the flow of water and helping reduce erosion. The floodplain forests help to filter out sediments, chemicals and nutrients associated with surface water runoff. The forest production of leaf litter yields organically rich soils that support active microbial populations of bacteria and fungi capable of naturally treating many of the contaminants that find their way into surface waters. The soils of intact riparian zones also hold water and release it slowly, aiding substantially in flood control. Floodplain forests shade waterways reducing water temperatures and in turn increasing dissolved oxygen levels. Riparian zones also offer substantial plant and animal habitat.

Overall, the floodplain forests of the Mississippi River are still in decline as a result of continued agricultural and urban development. Many of the Islands that were once associated with the river prior to channelization have disappeared and the forests they contained eliminated. Efforts to mitigate some of these changes and restore the floodplain forests are increasing as the benefits of these systems are realized.

INVASIVE SPECIES

ZEBRA MUSSEL (Photo USGS)

Today, many of the traditional geologic barriers between watersheds in the upper Mississippi River basin have been broached by canals developed for transportation and irrigation. The removal of these natural barriers has allowed the movement of new non-native species into the Mississippi River system. The development of international shipping on the Great Lakes has also led to incoming ships from far-flung locations routinely discharging ballast water from empty holding tanks into local waters. The net result has been the introduction of several species of organisms that did not evolve as part of the Mississippi River system. The most famous example of this type of invasive species is


Bighead Asian Carp
Photo: Missouri Department of Conservation

the zebra mussel. This Asian mussel made its way into the Illinois River in 1991 and now can be found throughout the entire Mississippi River basin. The mussel has begun to threaten native species as a result of its ability to blanket the floor of waterways, interfering with fish feeding and reproduction, as well as reducing dissolved oxygen levels in the water. Some organisms introduced into the river basin have been documented to pose a direct risk to humans. The Chinese mitten crab now found in Lake Erie is an intermediate host for the Chinese lung fluke, which can infect humans. Some species now threatening the river systems were intentionally brought to the United States. Both the bighead and silver carp were brought to America from Asia to control algae in ponds and lakes. These fish escaped and now compete directly with native species for food and habitat. None of the local organisms evolved in the presence of these new species and as a result there are few natural reduction factors to control their population. While it is already documented that many of these invasive species have begun to negatively impact native species, the long term effects of their introduction is still unclear.

WATER QUALITY IN THE MISSISSIPPI RIVER BASIN

Many substances can end up in the water and affect its quality. These include sewage, detergents, fertilizers, pesticides, sediments, toxic chemicals and automotive oils. Water pollution can be divided into two basic categories, the first being *point source pollution*. This is pollution is characterized by an obvious entry point or source. Examples of point source pollution are chemical spills, discharge from a specific wastewater treatment plant, discharge from a production factory or a leaking underground storage tank. The encouraging news is that, following the passage of the clean water act in 1972, a significant amount of point source pollution occurring in the river basin has been reduced or even eliminated.

Today the greatest pollution of the river occurs from *nonpoint source pollution*. Such pollution does not have an easily defined source and results from a wide variety of sources over a large area.

EXAMPLES OF NONPOINT SOURCE POLLUTION:

- Pesticide and fertilizer runoff from both farms and urban homes.
- Urban storm water runoff contaminated with road salts, soil, lawn chemicals, paints, oils, grease and gasoline.
- Overloaded and faulty septic systems.
- Household chemicals carelessly dumped down drains.
- Soil erosion from inappropriate land use practices associated with forestry, agriculture and livestock operations.
- Solid waste, chemicals and erosion resulting from poorly managed construction sites.

As a result of nonpoint source pollution, many of the river's fish species have detectable levels of harmful chemicals in their tissue, and the rivers less pollution tolerant species have been in significant decline. An influx of excess nutrients has had a profound effect on the river's ecosystems. Excess phosphates and nitrates routinely enter the river from agricultural fields, runoff from suburban lawns, and discharges from waste treatment systems. These nutrients lead to massive increases in algae populations. The algae blooms eventually die, resulting in decomposition that reduces the amount of oxygen available in the water for other forms of aquatic life. The entire river has been impacted by this effect; however, the impacts have been most dramatic in the delta region at the river's terminal discharge. The overabundance of nutrients has created a hypoxic zone (*without oxygen*) in the Gulf of Mexico. While some level of nutrients load is beneficial to the ecosystems of the river delta, excess of nutrients have begun to harm these ecosystems, creating large areas that fail to support any diversity of life. More information on Gulf Coast Hypoxia is provided in the *Wetlands* section of this guide.